REMARKS

Overview of the Office Action

The drawings have been objected to for not showing all features of the invention recited in the claims.

The disclosure has been objected to because the title is neither precise nor descriptive.

Claim 1-45 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over co-pending U.S. Patent Application Serial No. 10/654,918.

Claim 18 has been objected to as being indefinite and not further limiting the subject matter of claim 17.

Claims 1-45 have been rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention.

Claims 1-45 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

Claims 1-18, 20-34, 36-39, and 41-44 have been rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,717,906 to Shimano et al. ("Shimano").

Claims 19, 35, 40, and 45 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Shimano.

Claims 1-45 have been rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,594,222 to Maruyama et al., ("Maruyama").

Status of the claims

Claims 1-45 have been amended.

Claims 1-45 remain pending.

Objections to the drawings

The Office Action states that the drawings have been objected to for allegedly not showing all features of the invention recited in the claims. Specifically, the Office Action states that "diffracting function for setting L-th order and M-th order diffracted light of the light beam" and the "optical path difference giving structure" are not shown in the drawings.

The "diffracting function for setting L-th order and M-th order diffracted light of the light beam" is a limitation regarding the function of the diffractive structure. It is believed to be unnecessary to show this function in the drawings.

The "optical path difference giving structure" is clearly shown in the drawings and explained sufficiently in the specification. Referring to Figs. 2 and 3A-3C, the objective lens including the diffractive structure and the optical path difference giving structure is shown. As is explained in paragraphs 0204, 0205, and 0207-0220 of the published application, the diffractive structure 20 having blazed-shaped diffracting ring-shaped zones 21 is provided on an aspherical surface of the objective lens, and the optical path difference giving structure 30 is provided on the same surface of the diffractive structure by shifting a part of the surface of the diffractive structure in the optical axis direction.

As is clearly explained in the specification, Fig. 3B shows a part of the diffractive structure. As shown in Fig. 3C, the optical path difference giving structure is added to the diffractive structure by shifting a part of the surface of the diffractive structure in the direction of

the optical axis. As shown in Fig. 2, the diffractive structure and the optical path difference giving structure are provided on an aspherical surface of the objective lens. Further, Figs. 5, 6, 11, 13, 14, 15 and 16 show the objective lenses each having the diffractive structure and the optical path difference giving structure integrally on the optical surface. Therefore, the "optical path difference giving structure" element recited in the claims is clearly shown in the drawings.

Withdrawal of these objections is respectfully solicited.

Objections to the specification

The disclosure has been objected to because the title is allegedly neither precise nor descriptive.

The title has been amended to be more precise and descriptive of the present invention.

It is respectfully submitted that this objection has now been overcome.

Rejection of claims 1-45 under the doctrine of obviousness-type double patenting

The Office Action states that claims 1-45 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over co-pending U.S. Patent Application Serial No. 10/654,918 to Ota et al. ("Ota").

Specifically, the Office Action states that claim 1 of Ota and Applicants' claim 1 are not patentably distinct because both claims allegedly claim "the concept of maximum diffraction efficiency with the help of ring-shaped diffractive elements having dual wavelength diffraction capability."

Independent claim 1 recites an optical element of an optical pickup device for reproducing and/or recording information for a first optical information recording medium

having a protect substrate thickness t1 by using a light beam having a first wavelength λ1 emitted from a first light source, and for reproducing and/or recording information for a second optical information recording medium having a protect substrate thickness t2 (t2≥t1) by using a light beam having a second wavelength λ2 (λ2>λ1) emitted from a second light source. The optical element includes a diffractive structure having a plurality of diffracting ring-shaped zones arranged around an optical axis on at least one optical surface, and an optical path difference giving structure arranged on an optical surface of at least one of the plurality of diffracting ring-shaped zones, for giving a prescribed optical path difference to a prescribed light beam passing through the diffracting ring-shaped zone. The optical surface of the diffractive structure is a structure having a diffracting function for setting L-th (L≠0) order diffracted light of the light beam having the first wavelength λ1 to a maximum diffraction efficiency and for setting M-th (M≠0) order diffracted light of the light beam having the second wavelength λ2 to a maximum diffraction efficiency in case of an assumption of no existence of the optical path difference giving structure.

Ota discloses an optical objective lens having diffractive structure thereon. Independent claim 1 of Ota recites an objective light converging element that is used in an optical pickup device and is also used to converge a light flux having a reference wavelength λ_0 (380 nm $\leq \lambda_0 \leq$ 450 nm) emitted from a light source onto an information recording plane of an optical information recording medium equipped with a protective substrate having a thickness of 0.6 mm. The optical objective lens includes a lens structural section to refract a light flux emitted from the light source, and a ring-shaped diffractive structural section having an optical axis on a center. The ring-shaped diffractive structural diffracts a light flux emitted from the light source. An order K of a diffracted-light ray having the maximum diffraction efficiency among

diffracted-light rays of the light flux generated by the diffractive structural section satisfies the formula: $3 \leq K \leq 14$ (provided that K is an integer).

Ota's independent claim 1 fails to recite, disclose, or suggest the optical element having both a diffractive structure and an optical path difference giving structure. Further, Ota does not suggest providing the optical path difference giving structure as well as the diffractive structure on the objective lens. Therefore, independent claim 1 of the present application is patentably distinct from Ota's independent claim 1.

Applicants submit that the obviousness-type double patenting rejection has now been overcome.

Objection to claim 18

The Office Action states that claim 18 has been objected to as being indefinite and not further limiting the subject matter of claim 17 because it is not clear what the "magnification m" relates to.

Claims 18, 34, 39, and 44, each of which recite the phrase "magnification m" have been amended to clarify that magnification m is a magnification m of the objective optical element.

Support for these claim amendments can be found at least in paragraphs 0094, 0135, 0304, and 0399 of the published application.

Applicants submit that this objection has now been overcome.

Rejection of claims 1-45 under 35 U.S.C. § 112, first paragraph

The Office Action states that claims 1 and 36 contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use

the invention. Specifically, the Office Action states that the "L-th order and M-th order diffracted light" recited in the claims is not described in the specification.

As is described in the Description of Related Art section of the published application (see paragraphs 0008 – 0014), a diffractive structure is well known in the art. A person skilled in the art can control the diffraction efficiency of the predetermined diffracted light, and control the orders of the diffracted lights having the maximum diffractive efficiency, in accordance with an intended use of the diffracted light, in response to the wavelength of the utilized light fluxes by adjusting the structure (especially the depth) of the diffractive structure.

For example, given a first light flux and a second light flux, each having a wavelength 1 and a wavelength 2, the diffraction efficiency of a -1th order diffracted light of the first light flux can be made higher by optimizing the structure of the diffractive structure for the first light flux (see paragraphs 0221-0223 and Fig. 8 of the published application).

Therefore, it is respectfully submitted that the specification sufficiently explains the subject matter of the invention such that one skilled in the art would be able to make and/or use the invention.

The Office action further states that the phrase "an assumption of no existence of the optical path difference giving structure" recited in claim 1 is not defined at all and it is not clear what is meant by "assumption" and what are the limits of this assumption.

The phrase "an assumption of no existence of the optical path difference giving structure" recited in independent claim 1 can be understood by a person skilled in the art with reference to Figs. 2, 3B, and 3C and the associated description.

Referring to Fig. 2, the diffractive structure and the optical path difference giving structure are integrally provided on an optical surface of the objective optical element. The light

flux passing through the objective optical element is affected by both the diffractive structure and the optical path difference giving structure. The portion of independent claim 1, which recites "an assumption of no existence of the optical path difference giving structure" naturally refers to the case where only the diffractive structure (shown in Fig. 3B) is provided on the objective optical element (shown in Fig. 2 as a dotted line). Therefore, the last paragraph in independent claim 1 refers to the function of the diffractive structure before the optical path difference giving structure is provided.

In view of the forgoing, it is respectfully submitted that the rejections under 35 U.S.C. § 112, first paragraph have now been overcome and should be withdrawn.

Rejections of claims 1-45 under 35 U.S.C. § 112, second paragraph

The Office Action states that claims 1 and 36 fail to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Specifically, with respect to claim 1, the Office Action states that it is not clear what are the meets and bounds of the claim language which claims M-th and L-th order diffracted light. It is not clear what number M or L represents or how the number relates to wavelength.

As is described in the Description of Related Art section of the published application (see paragraphs 0008 – 0014), a diffractive structure is well known in the art. A person skilled in the art can control the diffraction efficiency of the predetermined diffracted light, and control the orders of the diffracted lights having the maximum diffractive efficiency, in accordance with an intended use of the diffracted light, in response to the wavelength of the utilized light fluxes by adjusting the structure (especially the depth) of the diffractive structure.

For example, given a first light flux and a second light flux, each having a wavelength 1 and a wavelength 2, the diffraction efficiency of a -1th order diffracted light of the first light flux can be made higher by optimizing the structure of the diffractive structure for the first light flux (see paragraphs 0221-0223 and Fig. 8 of the published application).

A person skilled in the art can determine the number M or L in accordance with the intended use of the optical element and control the structure of the diffractive structure. The optical path difference giving structure of the present invention gives an optical path difference to the light flux diffracted by the diffractive structure. Therefore, it is respectfully submitted that what number M or L represent or how they relate to wavelength is in fact clear to one skilled in the art.

The Office Action further states that the phrase "an assumption of no existence of the optical path difference giving structure" is not defined and that the word "assumption " makes the claims indefinite.

The phrase "an assumption of no existence of the optical path difference giving structure" recited in independent claim 1 can be understood by a person skilled in the art with reference to Figs. 2, 3B, and 3C and the associated description.

Referring to Fig. 2, the diffractive structure and the optical path difference giving structure are integrally provided on an optical surface of the objective optical element. The light flux passing through the objective optical element is affected by both the diffractive structure and the optical path difference giving structure. The portion of independent claim 1, which recites "an assumption of no existence of the optical path difference giving structure" naturally refers to the case where only the diffractive structure (shown in Fig. 3B) is provided on the objective optical element (shown in Fig. 2 as a dotted line). Therefore, the last paragraph in independent

claim 1 refers to the function of the diffractive structure before the optical path difference giving structure is provided.

In view of the forgoing, it is respectfully submitted that the rejections under 35 U.S.C. § 112, second paragraph have now been overcome and should be withdrawn.

Rejections of claims 1-18, 20-34, 36-39, and 41-44 under 35 U.S.C. § 102(e)

The Office Action states that Shimano teaches all of the recited elements in the specified claims.

Shimano discloses an objective optical lens utilized for recording or reproducing two kinds of recording mediums (i.e., CD and DVD). The objective optical lens of Shimano has a circular phase shifter and an annular phase shifter on an optical surface. In the objective lens, each of the circular phase shifter and the annular phase shifter gives a phase shift to each of the lights for CD and DVD. The phase shift of each of the light controls (for both recording mediums) the spherical aberration due to the difference in the thickness of the transparent substrates of CD (1.2 mm) and DVD (0.6 mm). Each of the phase shifters in Shimano has only one optical function, which is to impart a phase shift to each of the lights for a CD and a DVD. Nothing in Shimano teaches or suggests an objective optical element that includes a diffractive structure and an optical path difference giving structure. In other words, Shimano fails to teach or suggest an objective optical element having two structures each having a different optical function.

In contrast to Shimano, Applicants' independent claim 1 recites an optical element of an optical pickup device for reproducing and/or recording information for a first optical information recording medium having a protect substrate thickness t1 by using a light beam having a first

wavelength λ1 emitted from a first light source, and for reproducing and/or recording information for a second optical information recording medium having a protect substrate thickness t2 (t2≥t1) by using a light beam having a second wavelength λ2 (λ2>λ1) emitted from a second light source. The optical element includes a diffractive structure that has a plurality of diffracting ring-shaped zones arranged around an optical axis on at least one optical surface, and an optical path difference giving structure arranged on an optical surface of at least one of the plurality of diffracting ring-shaped zones, for giving a prescribed optical path difference to a prescribed light beam passing through the diffracting ring-shaped zone. The optical surface of the diffractive structure is a structure having a diffracting function for setting L-th (L≠0) order diffracted light of the light beam having the first wavelength λ1 to a maximum diffraction efficiency and for setting M-th (M≠0) order diffracted light of the light beam having the second wavelength λ2 to a maximum diffraction efficiency in case of an assumption of no existence of the optical path difference giving structure.

The diffractive structure recited in claim 1 provides a diffractive effect to each of the lights for plural recording mediums, and the optical path difference giving structure further gives an optical path difference to each of the diffracted light. In other words, the objective optical element of the present invention substantially gives plural optical functions to the light passing through the objective optical element.

The Examiner cites col. 17, line 11 to col. 18 line 15 and Figs. 8 and 14 of Shimano as teaching all of the claimed elements. It is respectfully submitted that the cited passages from Shimano have been misinterpreted by the Examiner.

The passages cited in Shimano by the Examiner describe an embodiment of a lens that includes phase shifters. Nothing is taught or suggested regarding an objective optical element

that includes a diffractive structure and an optical path difference giving structure, as recited in independent claim 1.

In view of the foregoing, it is respectfully submitted that Shimano does not teach or suggest the subject matter recited in independent claim 1. Specifically, Shimano does not teach or suggest an optical element of an optical pickup device for reproducing and/or recording information for a first optical information recording medium having a protect substrate thickness t1 by using a light beam having a first wavelength λ1 emitted from a first light source, and for reproducing and/or recording information for a second optical information recording medium having a protect substrate thickness t2 ($t2 \geq t1$) by using a light beam having a second wavelength λ2 ($\lambda2 > \lambda1$) emitted from a second light source. The optical element includes a diffractive structure that has a plurality of diffracting ring-shaped zones arranged around an optical axis on at least one optical surface, and an optical path difference giving structure arranged on an optical surface of at least one of the plurality of diffracting ring-shaped zones, for giving a prescribed optical path difference to a prescribed light beam passing through the diffracting ring-shaped zone. The optical surface of the diffractive structure is a structure having a diffracting function for setting L-th ($L \neq 0$) order diffracted light of the light beam having the first wavelength λ1 to a maximum diffraction efficiency and for setting M-th ($M \neq 0$) order diffracted light of the light beam having the second wavelength λ2 to a maximum diffraction efficiency in case of an assumption of no existence of the optical path difference giving structure.

Claims 2-18, 20-34, which depend directly or indirectly from independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, deemed to be patentably distinct over Shimano for at least those reasons discussed above with respect to independent claim 1.

Independent claim 36 recites limitations similar to those in independent claim 1 and is, therefore, patentable over Shimano for reasons discussed above with respect to independent claim 1.

Claims 37-39 and 41-44, which depend directly or indirectly from independent claim 1, incorporate all of the limitations of independent claim 36 and are, therefore, deemed to be patentably distinct over Shimano for at least those reasons discussed above with respect to independent claim 36.

Rejection of claims 19, 35, 40, and 45 under 35 U.S.C. § 103(a)

With respect to claims 19 and 35, the Office Action states that Shimano teaches all of recited elements except that a curvature radius R1 of a paraxial region of an optical surface on a light source side and a curvature radius R2 of a paraxial region of an optical surface on the optical information recording medium side satisfies a formula: $-3.2 < R2/R1 < -1.9$, which would have been routine experimentation and optimization in the absence of criticality.

With respect to claims 40 and 45, the Office Action states that Shimano teaches all of the recited elements except a third light source for third thickness, which would have been obvious at the time of invention to anyone skilled in the art.

Shimano has been previously discussed in detail and shown to not teach or suggest the invention recited in independent claims 1 and 36.

Claims 19, 35, 40, and 45, which depend directly or indirectly from independent claims 1 and 36, incorporate all of the limitations of the respective independent claim and are, therefore, patentably distinct over Shimano for at least those reasons provided for independent claims 1 and 36.

Rejection of claims 1-45 under 35 U.S.C. § 102(e)

The Office Action states that Maruyama discloses all of the recited elements.

Maruyama discloses an objective lens utilized for plural recording mediums. The objective lens has a diffractive structure on an optical surface. The objective lens has an inner area (a common area) and an outer area (an exclusive area) surrounding the common area. In the objective lens, the diffractive structure provided on the common area and the diffractive structure provided on the exclusive area have different characteristics (i.e., wavelength dependency) from each other. However, Maruyama fails to disclose an optical path difference giving structure, which gives an optical path difference to the diffracted light passing through the diffractive structure. In other words, Maruyama does not describe to give two optical functions to light passing through the objective optical lens by providing two structures.

In contrast to Maruyama, independent claim 1 recites an optical element of an optical pickup device for reproducing and/or recording information for a first optical information recording medium having a protect substrate thickness t1 by using a light beam having a first wavelength $\lambda 1$ emitted from a first light source, and for reproducing and/or recording information for a second optical information recording medium having a protect substrate thickness t2 ($t2 \geq t1$) by using a light beam having a second wavelength $\lambda 2$ ($\lambda 2 > \lambda 1$) emitted from a second light source. The optical element includes a diffractive structure that has a plurality of diffracting ring-shaped zones arranged around an optical axis on at least one optical surface, and an optical path difference giving structure arranged on an optical surface of at least one of the plurality of diffracting ring-shaped zones, for giving a prescribed optical path difference to a prescribed light beam passing through the diffracting ring-shaped zone. The optical surface of

the diffractive structure is a structure having a diffracting function for setting L-th ($L \neq 0$) order diffracted light of the light beam having the first wavelength $\lambda 1$ to a maximum diffraction efficiency and for setting M-th ($M \neq 0$) order diffracted light of the light beam having the second wavelength $\lambda 2$ to a maximum diffraction efficiency in case of an assumption of no existence of the optical path difference giving structure.

However, Maruyama fails to disclose an optical path difference giving structure which gives an optical path difference to the diffracted light passing through the diffractive structure. In other words, Maruyama does not describe giving two optical functions to light passing through the objective optical lens by providing two structures.

The Examiner cites Fig. 3 and the Summary of Maruyama as teaching all of the claimed features. It is respectfully submitted that the cited passages have been misinterpreted by the Examiner.

The passages cited in Maruyama describe an objective lens for an optical pick-up which has a diffractive lens structure. The objective lens includes a common area and an exclusive area surrounding the common area. In the objective lens, the diffractive structure provided on the common area and the diffractive structure provided on the exclusive area have different characteristics from each other. Nothing is taught or suggested regarding an objective optical element that includes a diffractive structure and an optical path difference giving structure, as recited in independent claim 1.

Further, Figs 3A and 3B of Maruyama are cross-sectional views of a boundary portion between the common area and the high exclusive area. Again, nothing is taught or suggested regarding an objective optical element that includes a diffractive structure and an optical path difference giving structure, as recited in independent claim 1.

In view of the foregoing, it is respectfully submitted that Maruyama does not teach or suggest the subject matter recited in independent claim 1. Specifically, Maruyama does not teach or suggest an optical element of an optical pickup device for reproducing and/or recording information for a first optical information recording medium having a protect substrate thickness t1 by using a light beam having a first wavelength $\lambda 1$ emitted from a first light source, and for reproducing and/or recording information for a second optical information recording medium having a protect substrate thickness t2 ($t2 \geq t1$) by using a light beam having a second wavelength $\lambda 2$ ($\lambda 2 > \lambda 1$) emitted from a second light source. The optical element includes a diffractive structure that has a plurality of diffracting ring-shaped zones arranged around an optical axis on at least one optical surface, and an optical path difference giving structure arranged on an optical surface of at least one of the plurality of diffracting ring-shaped zones, for giving a prescribed optical path difference to a prescribed light beam passing through the diffracting ring-shaped zone. The optical surface of the diffractive structure is a structure having a diffracting function for setting L-th ($L \neq 0$) order diffracted light of the light beam having the first wavelength $\lambda 1$ to a maximum diffraction efficiency and for setting M-th ($M \neq 0$) order diffracted light of the light beam having the second wavelength $\lambda 2$ to a maximum diffraction efficiency in case of an assumption of no existence of the optical path difference giving structure.

Claims 2-18, 20-34, which depend directly or indirectly from independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, deemed to be patentably distinct over Maruyama for at least those reasons discussed above with respect to independent claim 1.

Independent claim 36 recites limitations similar to those in independent claim 1 and is, therefore, patentable over Maruyama for reasons discussed above with respect to independent claim 1.

Claims 37-45, which depend directly or indirectly from independent claim 1, incorporate all of the limitations of independent claim 36 and are, therefore, deemed to be patentably distinct over Maruyama for at least those reasons discussed above with respect to independent claim 36.

Conclusion

In view of the foregoing, reconsideration and withdrawal of all rejections, and allowance of all pending claims is respectfully solicited.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

Respectfully submitted,

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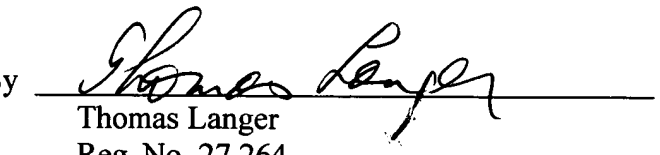
By 

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